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Handbook of Hearing Conservation

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Handbook of hearing conservation.



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Foreword

The *Handbook of Hearing Conservation* was prepared by the Office of Public Instruction to provide guidelines and minimum standards for educational hearing conservation programs throughout Montana.

In January 1980, the Office contracted with three consultants from the National Association of State Directors of Special Education to evaluate the nature and extent of audiological services in the state and make appropriate recommendations based on their evaluation. As a result, the Office contracted with Janet M. Zarnoch, special audiology consultant, to write and prepare guidelines and minimum standards for those hearing conservation programs funded through the Office. Ms. Zarnoch took a leave of absence from her position as a clinical audiologist at the University of Colorado Health Sciences Center in Denver to work on the project.

Current educational audiology programs in Montana and numerous documents from educational audiology programs in other states were reviewed. In addition, standards used in Montana, other states and by professional organizations were interpreted. The best information available was then consolidated into this handbook. Audiologists, aides, special education directors, superintendents and other professionals involved in the delivery of audiological services to the children of Montana also provided information.

The original draft of this handbook was distributed to a broad spectrum of audiology program personnel and school districts. As a result, a committee, composed of Kim Callahan, Shirley DeVoe, Gail Gray, Bette Hiner, Charles Lewis, Linda Lewis, Darrell Micken, Shirley Miller and Michael Raffin, reviewed the critiques received with Janet Zarnoch.

The Office is especially indebted to Ms. Zarnoch for her skill and her ability to condense a great amount of material into a practical handbook. The *Handbook of Hearing Conservation* will result in improved educational hearing conservation programs for the children of Montana and should serve as a model to educational programs throughout the nation.

Georgia Rice
Superintendent of Public Instruction
Office of Public Instruction
Helena, Montana 59601

November, 1980

Acknowledgement

This handbook could not have been completed without the cooperation of many people. I would like to extend my warmest thanks and appreciation to Kim Callahan, Audiologist, Havre Easter Seal Center, and Nella Thompson, Audiologist, Lewistown Easter Seal Center, for their valuable assistance in the preparation of this handbook, particularly in sharing many of their personal materials and Easter Seal audiology materials for inclusion in Appendix A. I am grateful to Shirley Miller, Director, State Special Education Unit, and Gail Gray, Manager of State Budget and Data, State Special Education Unit, for their endless patience, humor, and support throughout the writing of the handbook. I would also like to thank the rest of the 11th Avenue Special Education Unit staff for their assistance. Janice Badger, an audiologist in British Columbia also lent a helping hand to this project. Jim Watkins, Central Education Services Representative, Office of Public Instruction, deserves a special medal just for always being on my side.

Appreciation is also extended to the following professionals from all over Montana who shared their time and ideas with me, and patiently answered my many questions during the endless number of interviews these past few months.

Fred Appelman	Missoula Area Cooperative
Alden Beller	Special Education Director, Kalispell
Gene Bukowski	Audiologist—Helena Easter Seal Center
Robert Chaney	Associate Professor, University of Montana
Elaine Colie	Northcentral Cooperative Director
John Copenhaver	Special Education Services, Kalispell
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Diane Delwo	Audiologic Aide, Conrad Easter Seal Center
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Shirley DeVoe	Speech Pathologist—Director, Helena Cooperative
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Leslea Gilman	Audiologist—University of Montana
Chris Grover	Audiologist—Southwestern Montana Educational Cooperative
Cathy Holmes	Audiologist Aide—Butte Easter Seal Center
Joyce Hynes	Special Education Director, Bozeman
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Kathleen Rowe-Johnson	Audiologist, Great Falls
Sue Johnson	Audiologist—Billings Public Schools
John Kinna	Superintendent, Fairfield
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Flori McCurdy	Southwestern Montana Educational Cooperative Director, Deer Lodge
Marcie Mawer	Audiologic Aide—Southwestern Montana Educational Cooperative
Darrell Micken	Director of Audiology, Easter Seal Center, Bozeman
Russ Miller	Indian Health Service
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Tom O'Connor	Audiologist—Butte Easter Seal Center
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Phillip Whaley	Superintendent, Conrad
Dale Zorn	Superintendent, Shelby

Finally a few of my colleagues back in Denver deserve an extra special thanks—my Otolaryngology department chairman, Bruce Jafek, M.D. at the University of Colorado Health Services Center for approving my leave to consult in Montana; Florence Blager, for her assistance with speech and language referral criteria; and my dear friends Marion Downs and Jerry Northern for their expert critique of the handbook and for their unending encouragement and support of my ventures, particularly of the one which brought me to Montana.



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Chapter 1

Educational Hearing Conservation Program

Introduction

"We have measured, described, researched, catalogued, analyzed, and synthesized the entity of hearing loss. Now we must busy ourselves with the prevention of its devastating effects on children"

(Northern and Downs, 1978)

Few would argue with Northern and Downs but many might respond with the question . . . **how** do we prevent these devastating effects of hearing loss on children? The universal answer, if such a thing exists, would have to be through the establishment of comprehensive educational hearing conservation programs. These programs can provide services of identification, evaluation, counseling, remediation, and rehabilitation of hearing loss in children. If hearing conservation programs are truly comprehensive, inservice training is always available to parents, teachers, physicians, and all other members of the community who have direct or indirect impact on the quality of life of a hearing impaired child. It is only through such a total program that the devastating effects of hearing loss on children can be alleviated and/or prevented.

The purpose of this handbook is to provide information and guidelines for the audiologist, educators, and administrators responsible for comprehensive educational hearing conservation in the state of Montana. The handbook is not intended to be a final product. All individuals involved with hearing conservation programs are invited to share their ideas with the Office of Public Instruction. Only by modifying and updating the hearing conservation program guidelines can quality audiologic services for the children of Montana be maintained.

Educational Hearing Conservation Program

A comprehensive educational hearing conservation program is a finely tuned network of professionals who provide a wide range of services designed to meet the goals of alleviation and/or prevention of the devastating effects of hearing loss on children. The most common misconception surrounding the definition of hearing conservation is that it is the same as hearing screening. This misconception may be based on the fact that the hearing screening is one of the most visible services offered through hearing conservation programs. However, a hearing conservation program provides many other services in addition to the hearing screening.

It is convenient to break down an educational hearing conservation program into eight specific services. It should be noted that the eight services are related to one another in a series of ways, and none can really exist in the hearing conservation program as isolated entities. All the services must be carefully integrated to meet the goals of a hearing conservation program. The eight services or processes of a comprehensive hearing conservation program include the following:

1. Screening
2. Audiologic referral and assessment
3. Medical referral and assessment
4. Educational referral and assessment (speech, language, psychological evaluations and child study team (CST))
5. Remediation/Rehabilitation
6. Follow-up/Monitoring
7. Counseling
8. Inservice training programs.

In order to obtain a more accurate and complete understanding of hearing conservation programs, each of the above eight services will be discussed in the following pages. Each service will be discussed in terms of the role it plays in the comprehensive program.

1. **Screening**

"Screening tests sort out apparently well persons who probably do not have a disease from those who probably do have the disease . . ."

(Wilson & Junger, 1968)

The above quote clearly defines the purpose of screening tests. Screening tests are not intended to diagnose, but rather to identify those individuals who are in need of referral for in-depth evaluation and identification. In addition, screening tests should be accomplished in a fast, easy, and cost-efficient manner.

There is considerable literature concerning the theories of screening, criteria needed to justify mass screening, and how the results of screening for one disease compares to another. It is not necessary to review that literature in this handbook. Suffice it to say that hearing loss meets the criteria to justify a mass screening program and efforts are continually being made to develop and maintain hearing screening programs for all age groups.

Hearing Screening. In the 1920's the first mass hearing screening programs began in the public schools utilizing group hearing screening tests. Over the years, however, it became apparent that the group test method was not the most reliable and efficient means of accomplishing mass hearing screening in the schools. Individual pure tone screening tests replaced the group tests as a more accurate, but also more expensive screening procedure.

Since the early days of public school hearing screening programs, mass hearing screening programs have been initiated for all groups. Newborn hearing screening programs have been launched all over the world to identify hearing loss as early as possible. The single most important reason for early identification has been to assure early intervention to prevent and/or alleviate adverse development sequelae in speech, language, and other related areas. Preschool hearing screening has also come into widespread existence in recent years.

Overall, the traditional hearing screening program has witnessed significant changes in goals as well as scope. Throughout the years, most hearing screening programs have succeeded only in identifying moderate to severe hearing losses, and have a poor track record for the identification of mild hearing losses which may be significant impediments to educational development. Concerned professionals are no longer willing to settle for identification of only the moderate to severe hearing impairments. Current research on early identification and intervention of mild hearing losses suggests that we redefine and redirect our goals to include identification of those children with even the mildest hearing loss. Such redirection has created a need for changes in the customary test procedures and referral criteria used by many hearing screening programs. It is no longer acceptable to use only individual pure tone screening tests for the identification of hearing loss. We must also be concerned with identification of middle ear disease, as middle ear effusion continues to be the leading cause of hearing impairment in preschool and school age children (Orchik et. al., 1978). The traditional individual pure tone screening test only screens for hearing loss, not for middle ear disease. Thus, the screening program which best meets the needs of the children served is that which incorporates a hearing screening with a middle ear screening. The following section briefly discusses the rationale and incorporation of acoustic emittance screening of middle ear function into the traditional pure tone hearing screening program.

Middle Ear Screening. A number of studies have reported a correlation between the presence of middle ear effusion and linguistic, intellectual, social and educational delays in children (Holm and Kunze, 1969; Kaplan et. al, 1973; Bernstein, 1977; Howie, 1977). Traditionally, mass pure tone hearing screening programs have been relied upon to identify those children in need of referral for hearing loss and/or middle ear disease. However, pure tone screening programs alone are not adequate for identifying children with middle ear disease (Brooks, 1973, 1978; Harford et. al, 1978). It is common for a child to have middle ear disease accompanied by a hearing loss so mild (≥ 15 dB) that it is not identified by the pure tone screening. Despite the very mild nature, such losses may be a serious threat to a child's speech, language, and educational development. It appears important then to screen for middle ear disease in addition to screening for hearing loss. Acoustic immittance measurements objectively evaluate middle ear function, and can be easily adapted for use in mass screening programs involving all ages.

In recent years there has been significant attention directed toward the use of immittance measurements as a method of screening large populations for middle ear disease. The popularity of the technique can be attributed to the relative ease, reliability, and objectivity of the technique and the fact it has proven to be an extremely valuable tool in the identification of those individuals who are in need of medical referral for middle ear disease. Consequently, acoustic immittance screening is rapidly becoming an integral part of all hearing screening programs involving infants and children.

A few final comments regarding the screening portion of the hearing conservation program. The screening is the initial step in the total program and its purpose is to identify those children who are in need of additional evaluation and service. A reminder that hearing screening is **not** a diagnostic procedure and individuals who "pass" or "fail" the initial hearing screening or rescreening cannot be defined as having normal or abnormal hearing. Hearing screening in any age group does not measure hearing sensitivity—it merely separates those individuals who probably have normal hearing from those who probably do not have normal hearing.

The screening test usually takes place in a quiet room in the school using portable audiometric equipment. The hearing screening may be carried out by a nurse, an audiometric technician, or any other person trained in the administration of the test, as long as there is supervision by an audiologist. Any individual who fails the initial screening should be rescreened as soon as possible. The rescreening can also be administered via the support personnel, under the audiologist's supervision.

Rescreening. Rescreening employs the same set of techniques as the initial screening test and it is a step designed to increase the accuracy of referrals from initial screening failure who are in need of audiological and medical assessments. Rescreening is always administered to all those who fail the initial screening. If referrals were made on the basis of initial screening results only, there would be a high rate of over-referral, that is, children referred for further

evaluation who were in fact normal, and not in need of further evaluation. Therefore, rescreening eliminates a considerable amount of over-referral and helps to maintain the credibility of the screening procedures used to separate those who probably do have significant hearing problems from those who do not.

2. Audiologic Referral and Assessment/Evaluation

The role of the audiologic assessment/evaluation in the hearing conservation program is to determine the specific auditory sensitivity of each individual referred for failure on initial hearing screening or rescreening. The audiologic assessment should always be performed by an audiologist in a sound treated room. Since most schools do not have sound treated rooms on their premises audiologic assessments will usually be conducted in a clinic, hospital, or university speech and hearing center.

The audiologic assessment can, with a high degree of accuracy, identify those individuals with hearing impairments. Direct therapy with the hearing impaired child begins with the audiologic assessment. Counseling and support for the family and child is provided and arrangements are made for the future. In the case of middle ear disease several audiologic assessments are often necessary before a decision on treatment can be made. These assessments should be considered part of the child's special education treatment as well as overall assessment/evaluation of the child.

3. Medical Referral and Assessment/Evaluation

The medical referral and assessment/evaluation plays an important role in the hearing conservation program, particularly in terms of those children who fail the middle ear screening test. Just as the audiologic assessment/evaluation is used to determine the specific auditory function of children in question, the medical evaluation determines if there is specific ear disease which could be related to a child's hearing loss. Medical evaluations are performed by physicians and are essential for proper diagnosis of those children suspected of having a hearing loss, and for treatment of those children who have middle ear disease. The importance of medical diagnosis and treatment is evident in the fact that conductive hearing losses can be successfully treated in a great number of cases. The audiologic evaluation continues to play an important role during a child's medical assessment and intervention. The role is one of monitoring the hearing in cooperation with the physician to determine if the hearing is improving or remaining the same as a result of the medical treatment. Thus, audiologists must work to establish good rapport with physicians in the community so that children who are in need of simultaneous medical and audiological services can be served in optimal fashion.

4. Educational Referral and Assessment

Educational referral and assessment assumes a multifaceted role, one involving numerous individuals from many different professions. When there is reason to believe that hearing problems are jeopardizing a child educationally, a referral is usually made by an audiologist for an educational assessment. An educational assessment can mean a speech

and language evaluation to determine if the child is functioning normally; or, it can mean a combination of speech, language, psychological and other evaluations and/or conferences with parents and classroom teachers. If a child is found to have significant developmental delays which are interfering with learning in the classroom, a child study team (CST) is organized to review all developmental areas and make appropriate recommendations. The purpose of the CST is well-defined, however, the process by which a hearing impaired child arrives at a CST is poorly defined. There are guidelines in Chapter 3 of this handbook which address this much neglected area of how a hearing impaired child arrives at a CST. The reader is urged to carefully review those guidelines.

The educational referral and assessment provided by the hearing conservation program is a difficult service to define precisely because it is not a black and white area, but rather a "gray" area. The success of this portion of the hearing conservation program is largely dictated by the level of cooperation and communication between those who identify children in need of educational assessment and those who organize such assessments. All professionals dealing with hearing conservation programs must be committed to the uninterrupted, smooth transition from the identification of hearing loss in a child, to the educational assessment and intervention of that child.

5. Remediation/Rehabilitation

Remediation/rehabilitation services for hearing impaired children vary greatly, depending on the type and degree of hearing impairment and subsequent needs of the child. Types of services available range from a recommendation of preferential seating by the audiologist, to a complex individualized educational program (IEP) involving significant changes in the child's school routine. Medical and/or surgical treatment relating to hearing loss may be part of a particular child's remediation/rehabilitation process. In addition, all types of monitoring, counseling, parent/child/teacher intervention and training related to hearing should be considered part of the remediation/rehabilitation process.

The audiologist is faced with a difficult task when planning and implementing a rehabilitation program for a hearing impaired child. Children with mild-to-moderate hearing impairments present a unique challenge to the audiologist because these children frequently do not exhibit blatant educational difficulties as do the children with more severe losses. Thus, we do not really know when a mild hearing loss becomes educationally significant. Nevertheless, attention must be directed toward meeting the needs of children with mild-to-moderate losses. Only by trial and error, with careful documentation, will progress be seen in remediation and rehabilitation of those children with milder hearing impairments.

6. Follow-up/Monitoring

Follow-up and monitoring have a role in every service of the hearing conservation program. Children who fail screening and rescreening and who are then referred for evaluation(s) must be carefully followed and monitored on a regular basis. It is a waste of time to identify a hearing loss and then do nothing. Hearing losses are identified so that proper remediation and rehabilitation can be assured.

The audiologist on the hearing conservation team must continually monitor a child's hearing function through periodic reevaluation. In addition, the audiologist must communicate with all professionals involved in the child's rehabilitation and enlist their cooperation in periodic comprehensive review of the child's performance in all areas.

7. Counseling.

Counseling is another area which has a continual role throughout the hearing conservation program. Counseling of the child and parent must accompany all evaluations and interventions. The audiologist is usually the individual who offers counseling concerning the hearing problems and its implications, and makes recommendations to both the parent and child. The speech pathologist, psychologist and/or teacher offer additional counseling relating to educational development. The physician also plays a role in counseling during the evaluation and treatment of a child with middle ear disease.

The important thing to remember about counseling is that it must be honest and straight forward. All parent, child and other types of counseling should communicate the information in a manner which can be easily understood. Complicated descriptions and implications should be avoided during the counseling session as it tends to cause needless confusion and worry. It is best to speak plainly and honestly.

8. Inservice Training Programs.

Inservice programs are an integral part of the hearing conservation program. As with follow-up and counseling, inservice is an ongoing service which takes place at all levels of the total program. Inservices should be available for those who are actively involved in the actual hearing conservation program as well as those who are not actively or directly involved.

Guidelines and program suggestions for inservices are provided in Chapter 2. In Chapter 2, Section F the reader will find attention directed to five specific types of inservice training programs: 1) classroom inservice, 2) audiologist inservice, 3) teacher/school inservice, 4) aide inservice, and 5) community inservice. It is important to review the inservice descriptions in Chapter 2 to be familiar with the goals and procedures of each, and how each serves a unique role in the hearing conservation program.

Chapter 2

Guidelines and Minimum Standards for Hearing Conservation Programs

The Prime/Subcontracted Agency is responsible for meeting the guidelines and minimum standards contained in Chapter 2, as outlined in the Hearing Conservation Contract. If the Prime/Subcontracted Agency cannot meet the above the Office of Public Instruction will, in certain cases, approve modifications.

A. Roles and Responsibilities

Although there are many individuals involved in comprehensive hearing conservation programs in Montana, there are three specific individuals who are responsible for the overall organization, and coordination of the program. These individuals are: the program director/coordinator, the audiologist, and the audiologic aide. These three individuals are a constant factor across the hearing conservation programs in every school in the contract area. A fourth individual is the responsible school official, however, this person's identity will vary from school to school and district to district. Nonetheless, school officials also play an important role in the overall hearing conservation program as their cooperation and support is vital to the goals of the program. A fifth individual is the school nurse and/or the public health nurses. Many nurses, particularly public health nurses, are involved in hearing screening programs in Montana. Whenever public health nurses are involved in the hearing conservation program, they are under the direct supervision and coordination of an audiologist. The roles of the program director, audiologist, and audiologic aide are discussed separately below.

Program Director/Coordinator

The hearing conservation program director/coordinator will typically be the special education director of the prime agency responsible for administering the program. If the prime agency subcontracts for hearing conservation services, the subcontractor may assume the position of program director/coordinator. In either case, the hearing conservation program director/coordinator must assume the following responsibilities:

1. Coordinates, manages, supervises, and monitors the hearing conservation program.
2. Plans and provides in-service training for the audiologist(s) and audiologic aide(s). (See Chapter 2, Section F—Inservice Training Section.)
3. Recruits and hires qualified audiologists and audiologic aides as defined in the Hearing Conservation Contract.
4. Prepares a budget proposal for the hearing conservation program for submission to the Office of Public Instruction.
5. Prepares a yearly budget accountability report for the Office of Public Instruction as described in the Hearing Conservation Contract.
6. Arranges for equipment maintenance and repair through the agency that is contracting with the Office of Public Instruction for such services.
7. Consults with the audiologist and audiologic aide concerning inservices to teachers/superintendents and classroom students.
8. Maintains a working knowledge and communicates frequently with the audiologist of the audiologic literature concerning any procedures or techniques directly related to educational hearing conservation programs.
9. Acts as a key resource person in the contract area for matters relating to hearing conservation.
10. Assumes an intermediary role between the audiologist and the school administrators in the contract area.

Audiologist

The audiologist in the hearing conservation program must assume the following responsibilities:

1. Coordinates, manages, supervises, and monitors all aspects of all screening programs. This does not mean the audiologist should perform or be present at all screenings. See Appendix A for further discussion.
2. Administers all screening programs involving infants and preschoolers.
3. Interprets and classifies all screening results.
4. Delivers complete screening reports to the appropriate school official within two weeks of screening.
5. Determines the need for:
 - rescreening
 - annual monitoring
 - audiologic referral/assessment
 - medical referral (such referrals should be done through a letter and/or a phone call to the parents)
 - any other referrals and/or assessments deemed necessary.
6. Administers the comprehensive audiologic assessment, and counseling services to the child and parents (and teacher if indicated), concerning the results and recommendations.
7. Prepares audiologic reports in a concise but meaningful manner and distributes such reports to the appropriate individuals and/or institutions.
8. Consults with parents, teachers, physicians, speech pathologists, and any other involved party on the audiological status of any child in question.
9. Has knowledge of the handicapping effects and probable needs of children with hearing losses of varying degrees.
10. Has input into all child study teams involving hearing impaired children, either by sending a comprehensive audiologic report or by attending the session directly.
11. Has input into the planning of individualized educational programs (IEP) involving hearing impaired children.
12. Administers central auditory perceptual (CAP) testing if indicated, and prepares reports concerning results in the same fashion as with a conventional audiologic assessment.
13. Assumes a key role in the determination and management of educationally significant hearing losses. (See Appendix B)
14. Administers inservice programs to classrooms, teachers, superintendents, special education directors, physicians, parents, and community groups.
15. Develops and maintains a sophisticated record keeping system for all children screened, referred, evaluated, and monitored to keep the hearing conservation program operating efficiently.

Audiologic Aide

The audiologic aide typically spends most of his/her time working within the screening portion of the hearing conservation program. The aide is directly responsible to the audiologist and performs all tasks with direct or indirect supervision from the audiologist. The aide must be responsible for the following tasks:

1. Notifies the responsible school officials, through a letter form or phone call, to confirm screening and rescreening dates.
2. Assists the audiologist in recruiting school personnel and other volunteers to assist in the screening.
3. Assists the audiologist in training volunteers.
4. Obtains noise level measurements in the screening test room and fills out appropriate form for the audiologist's review.
5. Conducts pure tone and tympanometric screening tests for the school-aged population. **NOTE:** This task clearly involves a period of training and direct on-site supervision by the audiologist before the aide develops the necessary expertise to administer such screening tests. However, once the aide develops sufficient expertise the audiologist can maintain indirect supervision at all times, and provide direct supervision in a monitoring fashion several times during the school year. Monitoring should be easy to accomplish as the audiologist is frequently in the same school performing other related services when the aide is screening.
6. Assists the audiologist in screenings for the 0-5 year old population.
7. Fills out hearing screening forms, medical and audiological referral forms, as directed by the audiologist.
8. Assists the audiologist in classification and preparation of screening test results.

B. Prescreening Arrangements

Careful planning is essential for a successful hearing screening program. The following arrangements should be made by the audiologist and audiologic aide prior to actual screening dates. Arrangements should be made through the principal or responsible school official at the various schools in the audiologist's area. School officials are usually very cooperative and helpful if they fully understand the purpose of hearing screening.

Scheduling Appointments

1. Audiologists are responsible for scheduling hearing screening appointments through the school principal, or responsible school official.
2. All schools that are to be screened in September should be scheduled *before* the beginning of the school year.
3. Schools that are to be screened after September should be scheduled at least 3-4 weeks before the screening date.
4. Attempts should always be made to screen schools during the same month every year.
5. If a school desires screening at a specific time during the year, every effort should be made to meet such requests.
6. Attempts should be made to screen elementary schools, special education classes, new students and known hearing losses in the fall.

7. The audiologist should arrange for each school administrator to fill out HCP 002 "Class Roster" stating the number of students enrolled in each grade to be screened.

8. Audiologists should provide elementary classroom teachers with HCP 201 "Screening Preparation Sheet" before the screening appointment. This will assist the teacher in preparing the students for hearing screening and will enable "practice" time with the younger children.

9. Audiologists should request class rosters from elementary classroom teachers with remarks concerning any children the teacher may feel has a hearing problem.

Room Selection and Noise Level Measurements

1. The audiology team should select a screening test room in cooperation with the responsible school official prior to the actual screening date.

2. When selecting the screening test room three important factors must be considered: *ambient noise levels, location and size.*

Ambient Noise Levels:

If a sound level meter is used to determine ambient noise levels in the screening test room, the audiologist should refer to American National Standards Institute (ANSI) S3.1-1977 for *Criteria for Permissible Ambient Noise During Audiometric Testing*. When noise levels measurements are obtained with a sound level meter, such measurements should be recorded on NCP form 005. If the noise level measurements exceed those recommended in ANSI S3.1-1977, the audiologist should contact the responsible school official and request a room change.

If a sound level meter is not available for measuring ambient noise levels, the audiologist and/or aide (assuming normal hearing) should listen to the prescribed screening pure tones to determine if he/she can pass the pure tone screening. If the audiologist and/or aide can pass the pure tone screening test, the ambient noise levels are probably acceptable for valid screening results. However, if the audiologist and/or aide fails the pure tone screening test, environmental adjustments should be made within the test room to bring the ambient noise levels down to acceptable levels. If environmental adjustments such as turning off fans, or overhead lights do not reduce the ambient noise levels, then a different test room should be selected.

If sound level measurements are obtained for ambient noise in the school room where audiologists are performing pure tone threshold tests, ANSI 3.1, 1977 should be met. The noise level measurements for the pure tone threshold test room should also be recorded on HCP form 005. If a sound level meter is not available for measuring ambient noise levels in the pure tone threshold test room, the audiologist and/or aide (assuming normal hearing) should obtain a pure tone threshold audiogram on themselves to determine if valid thresholds measurements are possible in the ambient noise environment of the test room.

Location: The room should be located in a place which allows quick entry and exit of children and where there are convenient electrical outlets for the audiometric equipment.

Size: The room should be large enough (9 feet x 12 feet) to accommodate two separate test areas, one for pure tone screening and one for impedance screening. Ideally, these

test areas should be in close proximity to each other for increased efficiency. The room should also allow space for two equipment tables, chairs for the testers and chairs for the children waiting to be tested.

Equipment Maintenance

The accuracy of audiometric testing depends on the proper functioning of the audiometric equipment. Audiometers used in the hearing conservation program must be calibrated at regular intervals to determine if the frequency and hearing level outputs are in agreement with the control settings. All audiometers used in the hearing conservation program must be factory calibrated and cleaned once a year. Complete details concerning factory calibration, cleaning, and repair can be found in the *Equipment Maintenance Contract* issued by the Office of Public Instruction.

It is important for the audiologist and/or aide to perform frequent biologic calibration checks on all audiometric equipment. A biologic calibration check should include listening to pure tones at various frequencies and intensities in both earphones to determine any gross deviations in output, and checking for short circuits in the earphone cords.

Acoustic immittance instruments must also be factory calibrated and cleaned once a year as described in the *Equipment Maintenance Contract*. In addition, daily calibration checks should be made on the acoustic immittance instruments used for screening. Such daily checks should include calibration of the test cavity, probe-unit and automatic recording system (if applicable). ASHA (1978) recommends that electroacoustic calibration procedures be performed on a monthly basis according to the manufacturer's specifications.

C. Minimum Standards and Guidelines for Hearing Screening

The Office of Public Instruction recognizes that there are already many newborn, infant, and preschool hearing screening programs in existence in Montana. The extent of such hearing screening programs in a particular contract area should be determined. Audiologic services may already be provided through the existing screening programs. Attempts should be made to avoid duplication of screening services. In areas where there are no screening services available to the 0-5 year old population the audiologist should make every attempt to introduce such programs.

The groups to receive hearing screening can be divided into the preschool population (0-5 years) and the school-age population. However, the screening goals and procedures used to screen both populations cannot be classified into only two categories. There must be four categories of guidelines and minimum standards to cover hearing screening from birth through high school. These categories are:

1. newborn
2. infant screening (0-2 years)
3. preschool screening (2-5 years)
4. school-age (K and above)

Guidelines for newborn screening will be provided as recommendations, not mandatory procedures. Because of the limitations of this handbook, brief outlines of screening methods for the newborn will be provided along with information pertaining to where specific procedural guidelines can be obtained.

Newborn Hearing Screening

There are two major methods used to screen newborns for hearing loss and both take place in the newborn nursery. The two methods are:

1. High Risk Register
2. Crib-O-Gram

The third method is behavioral testing with very intense noisemakers of varying design and output. However, behavioral testing is not recommended for newborn screening unless used in conjunction with the High Risk Register (Northern and Downs, 1978). Nevertheless, in Montana, if an audiologist has the opportunity to test newborns in areas where there is no high risk register or crib-o-gram, behavioral tests are the only answer.

1. High Risk Register

The purpose of a high risk register is to identify infants with a particular family history and/or physical state which may be related to a specific handicap. There are many factors associated with hearing loss, but most hearing impaired infants will fall into one of five categories. These categories are listed below and have been recommended for use in High Risk Registers by the National Joint Committee on Infant Hearing Screening (Downs, 1978).

- a. A history of hereditary childhood hearing impairment;
- b. Rubella or other nonbacterial intrauterine fetal infections (e.g., cytomegalovirus infection, herpes infection);
- c. Defects of ear, nose and throat: malformed, low set, or absent pinnae, cleft lip or palate (including submucous cleft); any residual abnormality of the otorhinolaryngeal system;
- d. Birth weight less than 1500 grams;
- e. Any free or indirect serum bilirubin concentration judged to be potentially neurotoxic.

Information for the high risk register is obtained through maternal questionnaires and review of the infant's medical chart. Such information is frequently obtained by trained volunteers. Information concerning infants who meet the high risk criteria is given to the physician, nurse, audiologist, or whomever is in charge of the high risk register and/or follow-up of these newborns. For an indepth discussion of high risk register implementation, audiologists are referred to Downs and Sterritt (1967), Mencher (1976) and Northern and Downs (1978).

2. Crib-O-Gram

The crib-o-gram is an automated technique for screening the hearing of newborns (Simmons and Russ, 1974; Simmons, 1980). Motion sensitive transducers are placed beneath or in the crib to detect any significant motor activity. Motor activity is recorded before, during, and after the presentation of acoustic stimuli. Audiologists are referred to Simmons and Russ, 1974 and Simmons, 1980 for complete discussion of the crib-o-gram.

Infant Screening (0-2 years)

The most common and easily used method of administering screening to infants under 2 years of age is behavioral orientation tests. Figures 1A and 1B illustrate the levels of auditory maturation as related to behavioral orientation tests. It is mandatory that audiologists administer or *directly* supervise infant screening.

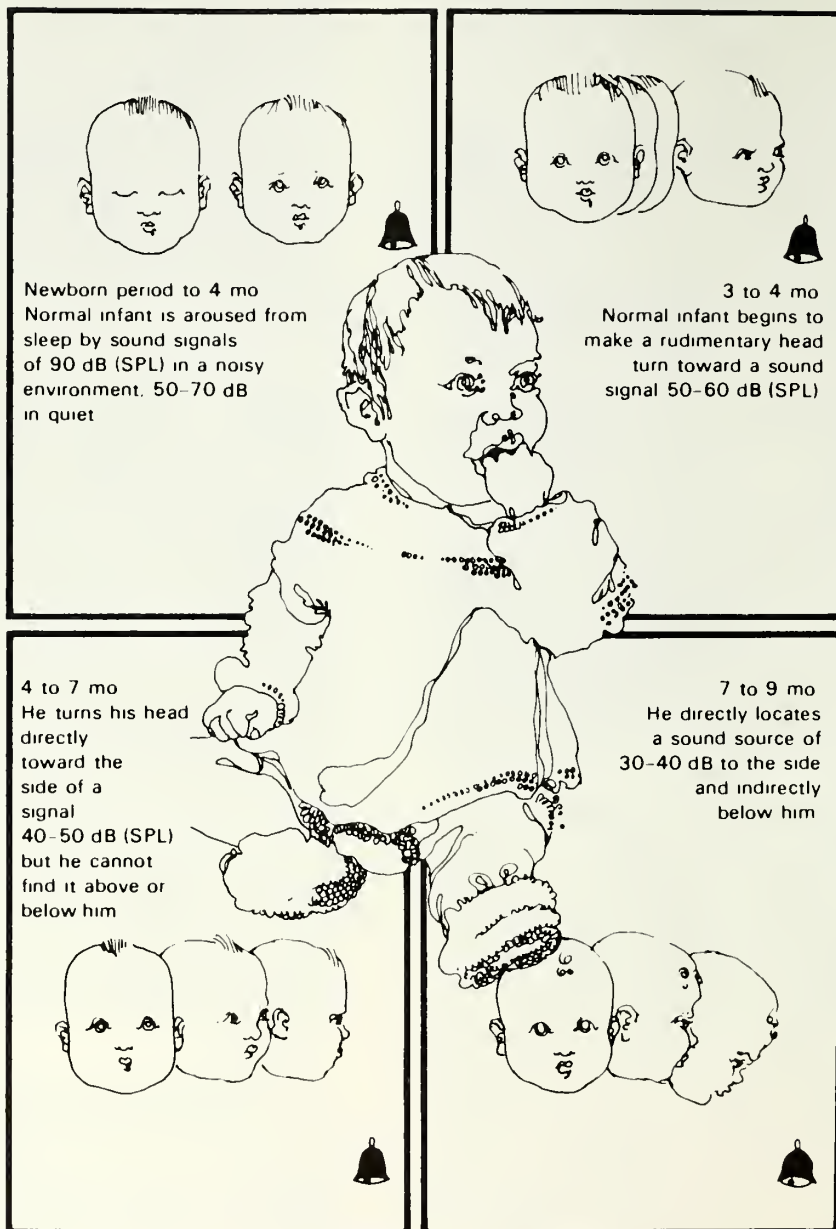


FIGURE 1A: Infant testing: newborn to 9 months. (Reprinted with permission from J.L. Northern and M.P. Downs: *Hearing in Children*. Baltimore: Williams and Wilkins Co., 1978.)

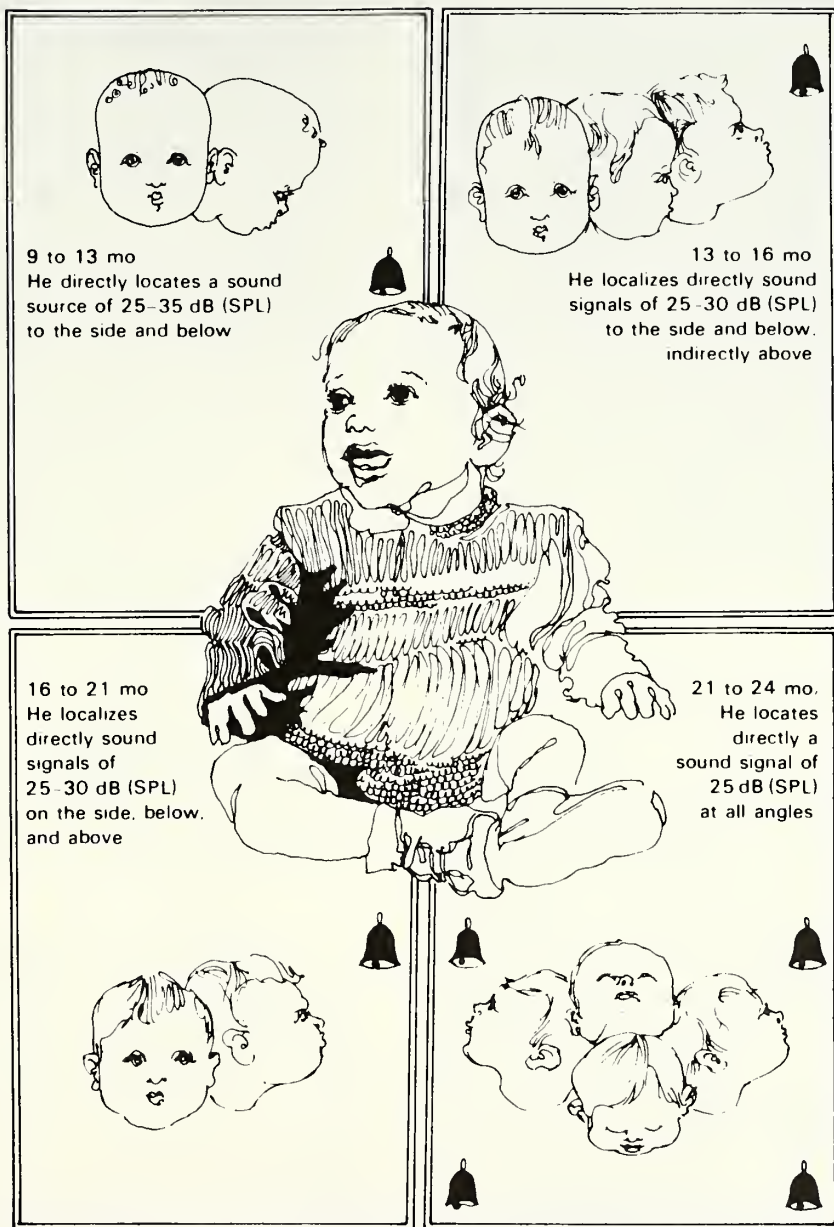


FIGURE 1B: Infant testing: 9 to 24 months. (Reprinted with permission from J.L. Northern and M.P. Downs: Hearing in Children. Baltimore: Williams and Wilkins Co., 1978.)

Minimum Standards

It should be understood that the following procedures are the minimum required for screening the infant under 2 years of age. Certainly, if the audiologist has access to Visual Reinforcement Audiometry (VRA) or Auditory Brainstem Response (ABR) audiometry for infant hearing screening, he/she may use such procedures in place of the behavioral orientation tests. Readers are referred to Galambos, 1978 and Banden and Peltzman, 1980 for complete discussion of ABR in infants. In addition, if the audiologist has access to a sound suite for infant screening, it is recommended that screening be performed there.

1. It is recommended that audiologists use calibrated noisemakers for behavioral hearing screening; such as those found in the Hear-Kit (TM).

2. The auditory behavior index for infants shown in Table 1 should be used for failure and referral criteria of behavioral screening tests.

3. Acoustic immittance measurements should accompany the screening test. See Chapter 2, E, for guidelines.

Failure/Referral Criteria

1. Any infant who clearly fails to demonstrate the normal age appropriate response should be considered for audiologic assessment as well as developmental assessment if indicated. The audiologist should obtain all pertinent historical information from the parents.

2. Impedance results should also be taken into consideration when referrals for further evaluation are recommended.

Age	Noisemakers (Approx SPL)	Warbled Pure Tones (Re Audiometric Zero)	Speech (Re Audiometric Zero)	Expected Response	Startle to Speech (Re Audiometric Zero)
0-6 wk	50-70 dB	78 dB (SD = 6 dB)	40-60 dB	Eye-widening, eye-blink, stirring or arousal from sleep, startle	65 dB
6 wk-4 mo	50-60 dB	70 dB (SD = 10 dB)	47 dB (SD = 2 dB)	Eye-widening, eye-shift, eye-blinking, quieting, beginning rudimentary head turn by 4 mo.	65 dB
4-7 mo	40-50 dB	51 dB (SD = 9 dB)	21 dB (SD = 8 dB)	Head-turn on lateral plane toward sound; listening attitude	65 dB
7-9 mo	30-40 dB	45 dB (SD = 15 dB)	15 dB (SD = 7 dB)	Direct localization of sounds to side, indirectly below ear level	65 dB
9-13 mo	25-35 dB	38 dB (SD = 8 dB)	8 dB (SD = 7 dB)	Direct localization of sounds to side, directly below, ear level, indirectly above ear level	65 dB
13-16 mo	25-30 dB	32 dB (SD = 10 dB)	5 dB (SD = 5 dB)	Direct localization of sound on side, above and below	65 dB
16-21 mo	25 dB	25 dB (SD = 10 dB)	5 dB (SD = 1 dB)	Direct localization of sound on side, above and below	65 dB
21-24 mo	25 dB	26 dB (SD = 10 dB)	3 dB (SD = 10 dB)	Direct localization of sound on side, above and below	65 dB

TABLE 1: Auditory Behavior Index for Infants: Stimulus and Level of Response*†

*Testing done in a sound room.

†Reprinted with permission from J.L. Northern and M.P. Downs: *Hearing in Children*. Baltimore: Williams and Wilkins, Co., 1978.

Preschool Screening (2-5 years)

It is difficult to establish a rigid testing criteria for this age group because children differ considerably in their maturation. One three year old may be able to raise his hand in response to a test tone for conventional audiometry, while the next three year old may not even condition properly for play audiometry. Thus, for each child the audiologist must make a general developmental assessment and utilize testing techniques which are appropriate for that developmental level.

There are *two* important concepts to keep in mind when testing the preschool population. (1) The object is to get as much information as possible in the shortest amount of time. For some children this may mean only getting impedance results and gross sound field measurements. For others, it may mean only getting an air conduction and bone conduction speech reception threshold (SRT) and tympanograms. It is up to the audiologist to decide what information will be the most useful in determining if the child is having hearing problems. (2) When there is doubt concerning at what level a child is functioning developmentally, testing techniques for the lower developmental level should be used. If the child performs adequately and has not tired out, higher level tests can be administered. In this way at least some useful information will be obtained, if in fact the child becomes restless, irritable, and difficult-to-test.

Minimum Standards

Tester

Only an experienced audiologist should screen preschool children due to the difficulties frequently encountered during testing. An aide may assist the audiologist as the need arises. It is extremely helpful to have a parent accompany the youngster. Often the parent can hold the child, give him the necessary instructions and reduce the child's anxiety about the testing situation.

Procedure

Before the audiologist begins any screening tests, he/she should obtain a brief history from the child's parent(s). Through such discussion with the parent(s) the audiologist can obtain important information concerning the child's overall performance, and the likelihood of significant middle ear problems and/or hearing impairment. All historical information should be recorded on HCP form 009.

Preschool screening test results should be recorded on HCP form 008. Recognizing that the audiologist may have to modify his screening procedure with this population, and that middle ear effusion is prevalent in 2-5 year old children, suggested priorities have been assigned to the following screening methods:

Suggested Priority 1—Acoustic Immittance screening;

Suggested Priority 2—Sound field localization responses to moisemakers, speech, warbled pure tones, or narrow band noise;

Suggested Priority 3—Speech awareness thresholds (SAT) or speech reception thresholds (SRT) under ear-phones;

Suggested Priority 4—Conditioned play audiometry under earphones to pure tone screening administered at 20 dB HL for the frequencies 1000 Hz, 2000 Hz, and 25 dB HL at 4000 Hz **or** Verbal Auditory Screening for Preschool Children (VASC) beginning at a 50 dB HL level and terminating at a 15 dB HL intensity level (Downs, 1978).

Failure Criteria

The failure criteria are based on the four test priorities given above.

1. *Acoustic immittance screening* results—see Chapter 2, Section E for failure and referral criteria relating to acoustic immittance screening;

2. *Sound field screening*—use the Auditory Behavior Index in table 1. A child 2-5 years of age with normal hearing should localize on all planes at 15 dB HL for speech and noise stimulus (Northern and Downs, 1978).

3. *Earphone screening using speech*—the 15 dB HL level should be used as the cutoff level for pass/fail (Northern and Downs, 1978).

4. *Conditioned play audiometry or VASC*—use the 15 dB HL level as the pass/fail criteria for the VASC and 20 dB HL level for conditioned play audiometry. For the conditioned play audiometry, failure to respond at 20 dB HL at 1000 Hz or 2000 Hz, or 25 dB HL at 4000 Hz in either ear is considered a failure.

Rescreening

Rescreening should be attempted on all screening failures.

Referral Criteria

Due to the fact that most audiologists have only one opportunity to see preschoolers for a hearing screening, the referral criteria is more conservative than that for the school-age child. It should be pointed out that any preschool referral made by an audiologist should be initially discussed with the parent. Before the audiologist firmly recommends any referral, he/she should take the historical information obtained from the parents into careful consideration.

1. If a child fails both the hearing and acoustic immittance screening, referral for audiologic and medical assessment should be made. In addition, if the child is suspected of any speech and/or language problems referral should be made for a speech and language evaluation;

2. If a child fails the hearing screening, an audiological referral should be recommended to the parent;

3. If a child fails the acoustic immittance screening and passes the hearing screening, a medical referral should be recommended to the parent. See Chapter 2, Section E for failure/referral criteria for impedance screening.

School Age Screening (K-1-2-3-(or 4)-7-11)

The goal of hearing screening in the school age population is to identify educationally significant hearing loss. The combined use of pure tone and acoustic immittance screening will increase the validity of the identification process.

It is not necessary for the audiologist to be present at all school screenings. The audiologist should delegate most of the actual screening responsibility to the aide. However, it is important that the audiologist coordinate and supervise all screening programs.

The audiologist must recognize his/her value in the stages of the hearing conservation program which follow the initial screening stage, and become comfortable delegating most of the responsibilities to the aide or other support personnel. Guidelines for defining the role of the aide, the audiologist, and the director/administrator are found in Chapter 2, Section A.

Minimum Standards

Population

It is mandatory that the following grades and categories be screened annually: K-1-2-3-(or 4)-7-11, all special education students, all referrals, all new students, and all students with known hearing loss.

Tester

Aides may perform all school-age hearing screening tests as long as they receive direct and/or indirect supervision from the audiologist.

Procedures

The following procedures are to be considered mandatory as the minimum standards:

1. Individual pure tone screening tests shall be administered to the population outlined above;

2. The frequencies to be tested are 1000 and 4000 Hz; the Office of Public Instruction recognizes that there is some question concerning how much the frequency of 2000 Hz contributes to the overall hearing screening process (Darrell Micken, Personal Communication, 1980). However, in an effort to resolve the question, audiologists and/or aides should continue to include 2000 Hz in the hearing screening throughout the 1980-81 school year. During that time the Office of Public Instruction will monitor the screening results at 2000 Hz to determine if it should permanently remain or be deleted from the mandatory screening frequencies;

3. The frequencies of 500 and 6000 Hz need not be tested;

4. Each child should be given practice test tones at 1000 Hz of 40-50 dB HL to be sure that the listening task is understood;

5. Following the practice tones the screening test should be administered using an intensity level of 20 dB HL for all frequencies. It is acceptable to screen 4000 Hz at 25 dB HL;

6. If a child does not hear the 20 dB HL, there shall be no re-presentation at higher intensity levels to see if the child can pass. All initial results must be recorded as they are;

7. All children who fail the screening as determined by the failure criteria should receive a pure tone threshold test which may be done *at the school* the same day. If the aide or other personnel are appropriately trained in pure tone threshold testing, they may administer the pure tone threshold test at the school.

Failure Criteria

Adherence to the following *minimum* standards is mandatory.

1. Any child who does not respond in the desired mode (i.e. handraising; verbal; nodding of the head, etc.) at any one frequency in either ear fails the pure tone screening.

Referral Criteria

Adherence to the following *minimum* standards is mandatory. The referral criteria are based on the pure tone threshold test results done at the school and the impedance screening test results. These criteria should be used in conjunction with the minimum standards and guidelines found in Chapter 3.

1. All children with a pure tone average of 25 dB or worse in either ear and "flat" tympanograms or negative peak pressure worse than -250 mm H₂O may be referred for medical evaluation (HCP 309). Such children should also be rescreened and/or followed in the audiology clinic by the audiologist (HCP 304).

2. All children with bilateral high frequency hearing losses who reveal thresholds of 25 dB HL or greater at 2000 Hz in the better ear and normal impedance results should receive annual pure tone threshold tests at the school or audiology clinic (HCP 304) and be considered for a speech and language evaluation. If such a loss is present in the poorer ear, annual pure tone threshold tests at the school or audiology clinic should be sufficient. However, if the audiologist has reason to believe the hearing loss is affecting the child's speech and language and/or educational performance, a speech and language screening should be requested.

3. All children with bilateral high frequency hearing losses who reveal thresholds of 35 dB HL or greater at 4000 Hz in the better ear and normal impedance results shall receive an annual pure tone threshold test at the school or audiology clinic (HCP304). If the audiologist is concerned about the educational performance of such children further recommendations and referrals should be made as needed.

4. All children with a unilateral severe hearing loss or a unilateral "dead" ear and a completely normal opposite ear should be monitored annually with a pure tone threshold test at the school or audiology clinic. In addition, the audiologist should send the following letters and/or forms:

a. HCP 310 "Letter to a Child with One Deaf Ear", by Marion P. Downs, M.A., sent to the parents with a cover letter;

b. HCP 203 "Preferential Seating" to the classroom teacher.

5. All audiologists are urged to carefully review Appendix B of this handbook for guidelines and minimum standards relating to determination and management of educationally significant hearing losses. The referral criteria for the school-age child which is discussed above should always be the minimum that a child receives. However, the minimum standards found in Appendix B must also be taken into consideration and utilized when dealing with children who fail the school screening.

D. Otoscope Screening

In many areas of Montana, otoscopic screening is routinely performed by the audiologist or aide prior to impedance screening. The reasons for inclusion of this procedure include: 1) identification of foreign objects in the external ear canal; 2) visual differentiation between a tympanic membrane perforation and tube. Conversely, there are reasons why otoscopic screening should *not* be included in the routine hearing screening programs for any age group: 1) additional time and cost involved; 2) the highly subjective nature of otoscopy even in the hands of experienced clinicians (Stool, 1973 and Paradise, 1976); 3) the subject must remain still and cooperative during the otoscopic examination to minimize risk associated with quick and/or sudden movements; 4) acoustic immittance screening for middle ear function is a more objective technique and does not require patient cooperation (Paradise, 1976). The Office of Public Instruction *strongly recommends stringent use of otoscopy* in the hearing conservation program.

Minimum Standards

The following standards must be adhered to by the Prime/Subcontracted Agency as required by the Hearing Conservation Contract.

1. Otoscopic screening should *not* be administered to any children under four years of age because of the risk involved with uncooperative subjects;
2. Otoscopic screening should *not* be performed on a routine basis;
3. Otoscopic screening may be performed *only* when it will provide additional useful information;
4. When an otoscopic screening is performed, the audiologist should enter a justifiable reason on the screening report form;
5. Otoscopic results must be reported carefully and *without diagnostic implication*.

E. Guidelines & Minimum Standards for Acoustic Immittance Screening

Background Information. There have been two sets of recommended guidelines for impedance (immittance) screening published during the last two years (Harford et al., 1978; AHSA, 1978). Both recommend the combined use of tympanometry and acoustic reflex measurement in establishing a screening program for the identification of middle ear disease. It has been observed that due to factors such as cost, time and equipment limitations, tympanometry alone is frequently used in Montana for middle ear screening. The Office of Public Instruction is in agreement with the current method of middle ear screening in most of Montana, and therefore does not require the use of acoustic reflex measurements.

Minimum Standards

The Prime/Subcontracted agency is responsible for meeting the following minimum standards for acoustic immittance screening as required by the Office of Public Instruction through the Hearing Conservation Contract.

Population

Acoustic immittance screening is *mandatory* in all hearing screening programs involving pre-school children 0-5 years of age, and school-age children in grades K-1-2-3 (or 4).

Tester

The aide can usually administer acoustic immittance screening to preschoolers without difficulty. However, the audiologist should either assist the aide, or independently administer the screening to newborns and infants.

Interpretation of Results

The audiologist shall be responsible for interpreting all results from the acoustic immittance screening. Caution should be used when interpreting results in infants under the age of seven months. The reason is that the technique has questionable validity and reliability when used to detect middle ear effusion in infants less than seven months of age (Paradise et al., 1976; Zarnoch and Balkany, 1978; Groothuis et al., 1979).

Procedures

Tympanometry is *mandatory* for the population described and should be administered bilaterally with the results recorded according to pressure and gross peak amplitude. However, only the middle ear pressure is used to determine failure criteria. If a "dome-shaped" or "flat" tympanometric curve is revealed, it should be noted on the record as such.

Failure Criteria (All ages)

1. Middle ear pressure of -250 mm H₂O or greater;
2. A "flat" or "dome-shaped" tympanometric pattern without a definite point of peak pressure;
3. Mild negative peak pressure (-150 to -225 mm H₂O) should be rescreened in 4-6 weeks. If the peak pressure is unimproved, one more rescreening should take place. If there is still no improvement in the peak pressure it should be considered a failure.

Referral Criteria (0-5 years)

The referral criteria are more stringent in the 0-5 year old group because the audiologist usually has one chance to screen this population and rarely has the opportunity to rescreen. The referral criteria for this group are shown on Table 2. The referral criteria are based on the combined tympanometric and pure tone screening results. Table 2 should be used by the audiologist as a general guide, as there are many variables and factors which must be weighed for appropriate referral and/or recommendation. It would be impossible to cover all combinations of variables and factors in this handbook.

**TABLE 2. Impedance Screening Referral Criteria
(0-5 Years)**

Classification	Pure Tone Screening Results	Impedance Screening Results	Recommendations
I. Pass	a) pass b) pass	a) normal b) -150 to -250 mm H ₂ O	a) none b) none
II. At Risk	a) pass b) fail	a) peak pressure greater than -250 mm H ₂ O, flat tympanogram, or dome-shaped tympanogram b) normal or slightly negative peak pressure (less than -250 mm H ₂ O)	a) *recommend medical referral to parents b) *recommend audiologic referral to parents
III. Fail	a) fail	a) peak pressure greater than -250 mm H ₂ O, flat tympanogram, or dome-shaped tympanogram	a) *referral for audiologic evaluation *referral for medical evaluation *referral for speech and language evaluation

*A minimum standard which should be followed.

Referral Criteria (School Age)

The acoustic immittance screening referral criteria for the school-age population are shown on Table 3. As with the preschool referral criteria, the school age criteria are based on the combined tympanometric and pure tone screening results.

1. All children with peak pressure of greater than -250 mm H₂O (or dome-shaped, or flat tympanograms) and a pass on the pure tone screening shall be rescreened in 4-6 weeks. If on rescreen tympanometry and pure tones are normal the child should be considered passing both. If the tympanometric results are unchanged or worse on rescreen and pure tone screening remains a pass, the audiologist should

send HCP form 307 (or a modification thereof) to the parents to alert them to the situation.

2. All children with mild negative peak pressure (-150 mm H₂O to -250 mm H₂O), regardless of pure tone screening results should be rescreened in 4-6 weeks. If the peak pressure remains unchanged, another rescreening should take place in 4-6 weeks or sooner. If at that time the peak pressure remains unchanged, and pure tone screening is normal, the audiologist should send HCP form 307 (or modification thereof) to the parents. If however, the pure tone screening and thresholds are abnormal, the audiologist should consider an audiologic evaluation (HCP form 302).

**TABLE 3. Impedance Screening Referral Criteria
(For School-Age)**

Classification	Pure Tone Screening Results	Impedance Screening Results	Recommendations
I. Pass	a) pass b) pass	a) normal b) -150 to -250 mm H ₂ O	a) none b) rescreen in 4-6 weeks (HCP form no. 307)
II. At Risk	a) pass b) fail	a) peak pressure greater than -250 mm H ₂ O, flat tympanogram, or dome-shaped tympanogram b) normal or peak pressure -150 to -250 mm H ₂ O	a) referral for medical evaluation, monitoring by audiologist; *rescreen in 4-6 weeks b) *rescreen in 4-6 weeks (HCP form 307), referral for audiologic evaluation (HCP form 302)
III. Fail	a) fail	a) peak pressure greater than -250 mm H ₂ O, flat tympanogram, or dome-shaped tympanogram	a) referral for audiologic evaluation; referral for medical evaluation; *monitoring by audiologist; *rescreen 4-6 weeks (HCP forms 309, 401)

* A minimum standard which should be followed.

F. Guidelines for Inservice Training Programs

Inservice training must be an integral part of the hearing conservation program. The success of any hearing conservation program depends largely on well planned and consistent inservice sessions. The hearing conservation program administrator should be responsible for organizing ongoing inservice training programs for the audiologist and aides under his/her employ, as well as organizing local community inservices for parents, local businesses, etc. The audiologist should assist the administrator in organizing and presenting such community inservice programs. In addition, the audiologist should take full responsibility for the school, teacher, and classroom inservice training, enlisting the assistance of the program aide, administrator, and/or other interested individuals.

Minimum Standards

The following paragraphs discuss the five types of inservice programs that must be a part of a comprehensive hearing conservation program.

1. *Audiologist Inservice:* The administrator of the hearing conservation program must provide inservice training for the program audiologist(s) in one of two ways:

- a. The administrator may independently organize an inservice program for purposes of evaluation, modification, and updating the audiologist's hearing conservation program. If the administrator chooses to organize the inservice then he/she is also responsible for keeping abreast of current literature in the field of audiology and education, and discussing such with the audiologist;
- b. The administrator may choose to send the audiologist(s) to appropriate inservice training sessions held by other agencies involved in hearing conservation programs in the state, or to other state or national meetings where the audiologist(s) can attend appropriate lectures, seminars, workshops, or inservice training sessions.

It is critical that audiologist inservice be provided as the audiologist is the individual who identifies the children with hearing disorders, and also determines the nature and degree of the hearing impairments. Thus, the program administrator must assure easy access to the avenues of continuing educational inservice training for the audiologist.

2. *Aide Inservice:* The program administrator should work in conjunction with the audiologist to administer comprehensive inservice training for the audiologic aide. The audiologist must clearly define the aide's roles and responsibilities, and be certain that information is adequately conveyed to the aide. The aide is a valuable asset to the program but only with the proper instruction and guidance. The audiologist and administrator should provide the aide with a written description of tasks he/she will be responsible for, and the procedures and standards to use for carrying out such tasks.

If it is possible for the aide to attend a comprehensive inservice provided by another agency, the Office of Public Instruction recommends that the administrator allow the aide to do so. The benefits would be that all or most of the aides could be trained together through the joint efforts of the individuals administering the inservice, resulting in an overall reduction in time required for training.

Regardless of what group or agency hosts the aide inservice training, certain topics must be covered. These are:

- purpose and nature of hearing conservation;
- basic anatomy and physiology of the ear;
- the role of normal hearing in speech, language, and educational development;
- hearing disorders, including types and causes of hearing loss;
- hearing screening guidelines and procedures;
- use and care of audiometric equipment;
- aide's duties and responsibilities;
- supervision.

3. *Teacher/School Inservice:* The audiologist must assume responsibility for the organization and presentation of inservices to the classroom teachers in his/her area. The audiologist may choose any method of inservice which is convenient and agreeable to all. However, attempts should be made to provide individual inservices to all teachers who are dealing directly with hearing impaired students in their classroom. Ideally, the audiologist should plan a group inservice at the beginning of the school year to introduce teachers, especially new ones, to the hearing conservation program in their area. This type of inservice should provide the teachers with useful, and significant information, including discussion of the following topics:

- basic anatomy and physiology of the ear;
- the role of normal hearing in speech, language, and educational development;
- types and degrees of hearing loss;
- handicapping effects of hearing loss as related to speech, language and educational development;
- goals of a comprehensive hearing conservation program;
- avenues of identification, follow-up, and remediation in the hearing conservation framework;
- basic introduction to hearing aids—how they work, different types, the limitations, and troubleshooting the aid;
- the services available through the hearing conservation, how to use them, the names of contact persons in each of the service areas.

The audiologist and/or program director/coordinator must be responsible for providing regular inservice to superintendents and other responsible school officials as described in the hearing conservation contract. The method of inservice is not critical, as long as it is agreeable to both the audiologists and school officials. However, it is up to the audiologist to initiate and maintain contact with the responsible school officials on the time basis described in the hearing conservation contract.

4. *Classroom Inservice:* Here again, it is the audiologist who must assume responsibility for organization and administration of classroom inservice. This type of program can be very effective if the audiologist uses a creative approach and enlists the assistance and cooperation of the students in the classroom.

It is important to remember that the only purpose of any inservice is educational in nature. In the case of classroom inservices, the aim should be to educate the students about the ear and hearing in a meaningful but enjoyable manner.

Specific attention should be directed to the following topics:

- basic anatomy and physiology of the ear;
- normal and abnormal hearing;
- what it is like to have a hearing loss (records which simulate different types and degrees of hearing loss are readily accessible);
- how we can protect our hearing from disease and loud noises;
- how deaf people communicate with sign language;
- description and demonstration of a hearing aid.

It is often easier to get elementary school students interested in an inservice than junior and high school students. Whereas younger children will be intrigued by sign language and eager to learn how to fingerspell their own name, the older students usually require a bit more energy and determination on the part of the audiologist to attract and maintain their attention. A useful technique with junior and high school students is to administer a pre-test before the inservice and a post-test at the end of the inservice. If nothing else, the pre-test/post-test encourages students to listen carefully so they can perform adequately on the post-test. The tests can be written or verbal, but the written is probably more effective because the students then have a record of the inservice for their own learning experience.

5. *Community Inservice:* In many hearing conservation programs in Montana there appears to be a considerable problem with adequate audiological follow-up of children

who fail the school screening. In some programs, audiologic follow-up is good but the medical follow-up is poor. Perhaps this is related to the fact that audiological services are free and the medical services require payment, unless recommended by the Child Study Team. In other areas, the parents may be diligent in obtaining the necessary audiologic and medical evaluations for their children, but the physicians may be lax or uncooperative in reporting their medical findings to the audiologist and/or school. In any case, there seems to be a universal need for increased awareness of the importance of follow-up in the hearing conservation program. Only by making a determined effort to educate the community will the total hearing conservation program be accepted and supported. It cannot be over-emphasized that widespread community acceptance is critical to the success of educational hearing conservation programs.

It is recommended that community inservices be coordinated at the beginning of the school year. The audiologist should make every attempt to attend local PTA meetings, womens' groups, mens' groups, local church organizations, physician group meetings and other community group meetings. If such community groups are approached in a congenial manner and given a brief explanation of the importance of the inservice, most will gladly cooperate. Community inservices require a minimal effort for maximal return in the success of the educational hearing conservation program.

Chapter 3

Guidelines and Minimum Standards for the Determination and Management of Educationally Significant Hearing Loss

The Prime/Subcontracted Agency is responsible for meeting the guidelines and minimum standards contained in Chapter 3, as outlined in the Hearing Conservation Contract. If the Prime/Subcontracted Agency cannot meet the above the Office of Public Instruction will, in certain cases, approve modifications.

A. Classification of Hearing Loss

Hearing loss is generally classified according to the *type* and the *degree* of impairment. The type of loss refers to what part of the ear is impaired. There are three types:

1. *conductive loss*— the damage or disease lies in the outer and/or middle portion of the ear;

2. *sensorineural loss*— the damage or disease is in the inner ear;

3. *mixed loss*— a combination of damage or disease in the inner ear, and the middle and/or outer ear.

The degree of hearing loss is measured in the same manner for the three different types of loss. Generally, the degree is based on the average decibel loss at the speech frequencies (500, 1000, and 2000 Hz). Table 4 (or modification thereof) is widely used by audiologists to describe the degree

of hearing loss. When an audiologist looks at an audiogram, he/she can quickly identify the type of loss present, as well as the degree of loss based on the pure tone average. However, an audiologist cannot determine the full nature and extent of a hearing handicap based solely on the type and degree of loss. There are numerous other factors which must be considered when determining the handicapping effects of a hearing loss. Because we are dealing with the population 0-21 years of age in the hearing conservation programs funded through the Office of Public Instruction, guidelines have been developed to assist audiologists, educators, and other professionals in the determination and management of the educational handicap imposed by the pressure of hearing loss.

TABLE 4. Degree of Hearing Loss According to Pure Tone Average

Degree of Hearing Loss	Pure Tone Average (PTA) in dB HL
normal hearing	0-15 dB
mild loss	15-25 dB
mild to moderate loss	25-40 dB
moderate to severe loss	40-65 dB
severe loss	65-90 dB
profound loss	90 dB +

B. Determination of Educationally Significant Hearing Loss Guidelines

Educationally significant hearing losses can only be determined by complete audiologic, otologic, speech, language, educational and other developmental assessments. Clearly, determination of educationally significant hearing loss is a difficult task. The task would be considerably easier if the determination of the educational handicap of a particular hearing loss could be based solely on decibel levels of loss. Unfortunately, a rigid decibel level cutoff point below which losses are educationally insignificant, and above which losses are educationally significant is a cruel injustice to many children who would be inadequately or falsely categorized.

How then does one make the determination of educationally significant hearing loss? As the first sentence of this section states, the determination rests with the correlation of all test results. Generally, a hearing loss can be considered potentially educationally significant when comprehensive evaluation reveals one or more of the following conditions:

1. speech/language delays
2. psychological delays
3. social delays
4. educational delays
5. lack of parental concern and cooperation
6. lack of cooperation within the team of involved professionals
7. unavailability of services of identification, assessment, and remediation.

The above seven conditions should be used as a guideline to determine if a child's hearing impairment is educationally significant. Obviously the guidelines are general and need clarification to be maximally effective. Thus, specific minimum standards have been developed to identify children with educationally significant hearing loss who are in need of additional services. These minimum standards will probably succeed in identifying most children with educationally significant hearing loss, but may not identify the "borderline" children. Those children who fall into the "borderline" category will have to rely solely on the professional judgement of the individuals who serve all children.

Minimum Standards

1. Bilateral Hearing Loss

Three categories of risk have been developed to assist audiologists in the identification of educationally significant hearing loss. Table 5 shows the three risk categories related to varying degrees of conductive, mixed, sensorineural, and high frequency hearing losses.

It should be noted that the three risk categories shown on Table 5 are based on bilateral hearing impairments revealed by pure tone threshold testing performed at the school as a result of screening failure. The reason the risk categories are based on the pure tone threshold test done in the school versus the audiology clinic is to facilitate the transition from

identification of hearing loss to direct educational intervention. Of course, if an audiologist sees a child with bilateral impairment in the audiology clinic, the categories of risk are still applicable. Table 5 should be utilized for reference immediately following pure tone threshold testing at the school to determine if a child is a risk for educationally significant hearing loss. Once a child has been placed in one of the three risk categories, the audiologist should consult Table 7 for guidelines and minimum standards concerning management of educationally significant hearing losses. Table 7 is discussed in the following section on management of educationally significant hearing losses.

TABLE 5. Risk Categories for Educationally Significant Hearing Loss*†

Degree of Loss	Type of Hearing Loss			High Frequency Loss:	
	A) Conductive	Mixed	Sensorineural	begins at 2KHz or 3KHz	begins at 4KHz or above
0-15 dB	MINIMAL RISK				
15-25 dB Mild	MILD RISK				
25-40 dB Mild to Moderate	MODERATE RISK				
40-65 dB Moderate to Severe	SEVERE RISK				
65-90 dB Severe to Profound					
90 dB + Profound					

*Based on bilateral hearing loss.

†Based on pure tone thresholds obtained at the school or the audiology clinic.

2. Unilateral Hearing Loss

Only one category of risk has been established for the determination of educationally significant hearing loss. This is a mild risk category and is shown on Table 6. The reference for all unilateral losses following the pure tone threshold test at the school should be Table 6.

In most instances when there is a unilateral loss of even a

profound degree and completely normal hearing in the opposite ear, the individual is *not* going to be educationally handicapped as a result of the one-sided impairment. Nonetheless, there are certain minimum standards of services which do apply to the unilaterally involved children. The minimum standards are discussed in the following section concerning management of educationally significant hearing loss.

TABLE 6. Risk Category for Educationally Significant Hearing Loss *†

Degree of Hearing Loss	Type of Hearing Loss			High Frequency:	
	Conductive	Mixed	Sensorineural	Begins at 2KHz or 3KHz	Begins at 4KHz or above
0-15 dB					
15-25 dB Mild					
25-40 dB Mild to Moderate					
40-65 dB Moderate to Severe					
65-90 dB Severe to Profound					
90 dB + Profound	Not applicable as conductive losses cannot exceed 60 dB.				

*Based on unilateral hearing loss.

†Based on pure tone thresholds obtained at the school or the audiology clinic.

C. Management of Educationally Significant Hearing Loss

The audiologist must assume a considerable amount of the management responsibility for children who fall into the minimal and moderate risk categories for educationally significant hearing loss. The management responsibility for such children will consist primarily of appropriate referral and/or recommendations.

When audiologists consult Tables 7 and 8 for management of children with educationally significant hearing loss, the following statements must be kept in mind; all mandatory referrals for further evaluation are mandatory *only* if the child has not yet been referred for such evaluation(s), or if he/she is in need of referral for re-evaluation.

Minimum Standards

1. Bilateral Hearing Loss (see Table 7)

The minimum standards concerning management of educationally significant bilateral hearing losses for each of the three risk categories are shown on Table 7. Table 5 and Table 7 should be used concurrently for determination and management of educationally significant bilateral hearing losses. The management of children in the minimal, moderate, and high risk categories is clearly outlined in Table 7. However, there are additional statements provided below which may clarify some of the guidelines and standards offered in Table 7.

TABLE 7. Guidelines for Management of Bilateral Hearing Loss*†

Degree of Hearing Loss	TYPE OF HEARING LOSS					High Frequency	
	Conductive	Mixed	Sensorineural	Begins at 2KHz or 3KHz	Begins at 4KHz or above		
0-15 dB	ASNA						
15-25 dB Mild	HE PS	ME ASNA	SLES PCTC	AC	HE ME	SLES PCTC	
25-40 dB Mild to Moderate	HE PSY	ME HAE	SLES INS	PCTC ASNA	PS AC	AC PS ASNA	
40-65 dB Moderate to Severe	HE	ME PS PCTC	SLES CST INS	PSY HAE			
65-90 dB Severe to Profound	Not applicable as conductive losses cannot exceed 60 dB.		ASNA				
90 dB+ Profound							

*Based on pure tone thresholds obtained at the school or the audiology clinic.

†Based on the risk categories shown on Table 5.

Indicates a minimum standard which must be met.

KEY

- HE- Referral for hearing evaluation (preferably performed in the audiology clinic, however, school audiogram as described in Chapter 2 is acceptable);
- ME- Referral for medical evaluation, preferably performed by an otologist or otolaryngologist (see Appendix A for sample forms and letters);
- SLES- Referral for speech and language screening or comprehensive speech and language evaluation performed by a speech pathologist;
- PCTC- Parent, child, teacher counseling by the audiologist (see Appendix A for sample forms and letters);
- AC- Annual check of hearing sensitivity;
- PS- Preferential seating in the classroom;
- PSY- Referral for psychological evaluation by school psychologist or other qualified professional;
- HAE- Referral for a hearing aid evaluation performed by an audiologist in a sound treated room
- ASNA- Referral for any additional services deemed necessary by the audiologist;
- INS- Inservice performed by the audiologist to parents, teachers, classroom students (see Chapter 2—Inservices);
- CST- Request for a child study team (may be requested by the audiologist);
- LODE- Letter to a child with one deaf ear (see Appendix A).

a. *Minimal Risk Category* (See Table 7)

1. The audiologist may refer children in the minimal risk category to a speech pathologist for a speech and language screening.

2. Parent, teacher and child counseling is required for all children in the minimal risk category. Letters are an acceptable form of counseling (see Appendix A).

3. If a medical evaluation is indicated the audiologist should make a referral for medical evaluation.

b. *Moderate Risk Category* (see Table 7)

1. The audiologist is required to refer all children in the moderate risk category to a physician for medical evaluation, and to a speech pathologist for a speech/language evaluation. Other professionals must be kept informed of the child's evaluation results and recommendations based on such, including notification of a child study team. An audiologist or speech pathologist may call a child study team for children who fall into the moderate risk category.

2. The audiologist is required to administer *annual* school pure tone threshold tests and/or threshold tests at the audiology clinic, or sooner, if needed for monitoring and/or follow-up. Other professionals involved in a child's total educational management must be kept informed of the child's audiologic status and/or progress.

3. If warranted, a child study team may be requested before all evaluations have been completed.

c. *High Risk Category* (see Table 7)

1. All referrals for further evaluation are mandatory as indicated by the asterisk (*) preceding each service in the high risk category.

2. A child study team should be requested with evaluative input from each of the professionals involved. The development of an individualized education program (IEP) will most likely result from a child study team involving a child with a hearing loss in the high risk group.

3. Each member of the aural rehabilitation team, i.e., audiologist, speech pathologist, psychologist, teacher, social worker, etc., must assume full responsibility for evaluation, re-evaluation, monitoring, and follow-up of the child in areas relating to his/her specialty.

4. Counseling is a very important part of the management of children in the high risk group, especially for the parents and children.

2. Unilateral Hearing Loss (see Table 8)

a. *Minimal Risk Category*

Although only one risk category has been established for children with unilateral hearing losses, not all of these children will require the same referrals and/or recommendations. The required referrals for further evaluation shown on Table 8 are the minimum, however, some children with unilateral hearing losses may require extensive services. All referrals for further evaluation for children with unilateral hearing losses should be initiated and/or provided by the audiologist.

TABLE 8. Guidelines for Management of Unilateral Hearing Loss *†

Degree of Hearing Loss	TYPE OF HEARING LOSS			High Frequency	
	Conductive	Mixed	Sensorineural	Begins at 2KHz or 3KHz	Begins at 4KHz or above
0-15 dB	ASNA				
15-25 dB Mild	<p>All children with unilateral hearing loss of 15 dB or greater should receive the following:</p> <p>HE HCP 302</p> <p>ME (if loss is greater than 25 dB) HCP 309</p> <p>PCTC</p> <p>AC HCP 304</p> <p>LODE (if loss is greater than 40 dB) HCP 310</p> <p>PS HCP 203</p> <p>HAE HCP 303</p> <p>ASHA</p> <p>NOTE: If a child has already recently received further evaluation(s) the audiologist need not repeat the particular referral(s).</p>				
25-40 dB Mild to Moderate					
40-65 dB Moderate to Severe					
65-90 dB Severe to Profound					
90 dB+ Profound					
	Not applicable as conductive losses cannot exceed 60 dB.				

*Based on pure tone thresholds obtained at the school or the audiology clinic.

†Based on the complete minimal risk category shown on Table 6.

Indicates a minimum standard which must be met.

KEY

HE-	Referral for hearing evaluation (preferably performed in the audiology clinic, however, school audiogram as described in Chapter 2 is acceptable);
ME-	Referral for medical evaluation, preferably performed by an otologist or otolaryngologist (see Appendix A for sample forms and letters);
SLES-	Referral for speech and language screening or comprehensive speech and language evaluation performed by a speech pathologist;
PCTC-	Parent, child, teacher counseling by the audiologist (see Appendix A for sample forms and letters),
AC-	Annual check of hearing sensitivity;
PS-	Preferential seating in the classroom;
PSY-	Referral for psychological evaluation by school psychologist or other qualified professional;
HAE-	Referral for a hearing aid evaluation performed by an audiologist in a sound treated room
ASNA-	Referral for any additional services deemed necessary by the audiologist;
INS-	Inservice performed by the audiologist to parents, teachers, classroom students (see Chapter 2—Inservices);
CST-	Request for a child study team (may be requested by the audiologist);
LODE-	Letter to a child with one deaf ear (see Appendix A).

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Appendix A

Sample Forms and Letters for the Hearing Conservation Program

Sample Forms and Letters

The following hearing conservation program forms and letters may be used by any hearing conservation program in the State of Montana. The forms and letters may be used as they are found here or modified to meet the needs of a particular program.

The forms and letters are organized into four categories each with a numerical correlation. These are:

- 1) 001-008: Forms relating to the actual screening;
- 2) 101-106: Forms and letters sent to school administrators;
- 3) 201-204: Forms and letters sent to teachers;
- 4) 301-310: Forms and letters sent to parents.

The number for each form is in the upper left hand corner and is preceded by HCP (hearing conservation program).

Index

1) Screening Forms

- HCP 001—Individual Hearing Screening Results
- 002—Class Roster
- 003—Special Referrals
- 004—Hearing Screening Record
- 005—Noise Level Measurements
- 006—Progressive Follow-up Referral Form
- 007—Prescreening Arrangements
- 008—Infant/Preschool Screening Form
- 009—Preschool Screening History Form

2) Letters and Forms

- HCP 100—Newspaper Announcement of School Screenings
- 101—Describing the Hearing Conservation Program
- 102—Scheduling Comprehensive Screening Appointment
- 103—Scheduling Fall Screening Follow-up
- 104—Scheduling Screening Follow-up
- 105—Predicted Monthly Schedule of Audiologist
- 106—Accountability Data

3) Letter and Forms to Teachers

- HCP 201—Letter for Elementary Classroom Screening Preparation
- 202—Special Referral Letter
- 203—Preferential Seating
- 204—Student Description Form

4) Letters and Forms to Parents

- HCP 301—Screening Notification
- 302—Hearing Evaluation Referral
- 303—Hearing Aid Evaluation Referral
- 304—Notification of Follow-up Evaluation
- 305—Could Not Contact Letter
- 306—Loss Unchanged Letter
- 307—Negative Pressure Letter
- 308—High Frequency Loss Letter
- 309—Medical Referral Letter; HCP 402 should accompany 309
- 310—Letter for One Dear Ear (cover letter should accompany)

For immediate release.

NEWSPAPER RELEASE

On the dates listed below, _____ from the _____ Hearing Conservation Program will again be in your area schools conducting hearing screening for the students. This testing is done without charge for all those 18 years of age and under as a service of your child's school district.

Hearing screening may involve any of the following procedures: first, a look in the ears to make sure the canals are clear; second, a test called "acoustic impedance" to determine the condition of the middle ear; third, a pure tone test which indicates how well an individual hears at different frequencies and fourth, a brief speech and/or language screening by the speech therapist.

If your child is under the care of a physician or an ear specialist you will probably want a copy of his or her results sent to the doctor. If, for some reason, you do not want your child's hearing screened, please contact your school.

Preschool children and adults may also come to the school at the time of screening for a hearing check.

Follow-up care and more extensive evaluation for children as well as adults is provided by appointment at _____.

-----For screening and identifying infants/preschoolers who are a risk for hearing problems-----

CHILD'S NAME _____ PARENTS _____ B/D _____ DATE _____

ADDRESS _____ TELEPHONE _____ Screened by _____

I. QUESTIONS TO ASK PARENT - Hearing evaluation referral recommended if one or more questions are answered YES.

1. Is there a history of inherited hearing loss on either side of the family? Yes ___ No ___
(i.e., a hearing loss not acquired as a result of accident, noise damage, aging, etc.). If YES, what is the relative's relationship to the child? _____
2. Has the child has any episodes of ear infections? Yes ___ No ___
If YES, How many? _____ At what ages? _____
3. Has the child ever had ear surgery and/or any other related surgery? Yes ___ No ___
If YES, Specify the type of surgery _____ When _____

